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THE TESTING AND MODIFICATION OF PERSONAL EQUIPMENT IN THE EIGHTH AIR FORCE.

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INTRODUCTION:

The personal equipment problems encountered by an operational air force depend on the nature of its mission, the geography of its operational zone, the climate conditions in that zone, and the competency, preparation and experience of the service facilities available to it. The problems encountered, therefore, will vary for each air force. It was anticipated that the difficulties met by the Eighth Air Force would be great, conditioned as they were by the great strength and long preparation of the enemy, the hazards of flights over treacherous waters, and the rigorous climatic conditions present over its base in Great Britain. Moreover, since it was the first American air force to embark on large scale operations, it served as a proving ground for the testing of protective flying equipment and the adequacy of the training of Air Forces personnel in its use. Further, since it began its functions before the complete mobilization of the technical and productive resources of the nation had occurred it was anticipated that defects in, and shortages of, equipment would occur.

In anticipation of these difficulties a new type of medical organization was set up in the Eighth Air Force. This unit, now designated as the First Central Medical Establishment (Sp), has served as a prototype for similar units in other air forces. One of its main sections, the Department of Physiology, was charged by the Surgeon, Eighth Air Force, with the testing and modification of all personal and safety equipment used or required by flying personnel. Its staff consists of trained air corps and medical officers, the latter consisting of both flight surgeons and aviation physiologists. The 41st Altitude Training Unit is attached to it. By means of field trips and the Personal Equipment Officers' School, which it conducted, the organization maintains a close liaison with the combat squadrons in the field, primarily through the personal equipment officers.

Early surveys, since confirmed by experience, indicated that the major personal equipment problems of the Eighth Air Force would arise because of two factors:

1. The vigor of enemy resistance (making high altitude flying necessary).
2. The sea surrounding its base in Britain.

Because of the violence of the enemy's defense, particularly of anti-aircraft, it was necessary that almost all heavy bomber missions be high altitude flights. This introduced two hazards, (a) low partial pressures of oxygen in the ambient air, and (b) low temperatures. The first, low partial pressure of oxygen, made important the

provision of an efficient oxygen system and adequate indoctrination in its use. This latter function, was the primary responsibility of the Altitude Training Units in the Zone of the Interior, a function which they performed creditably. The second hazard, low temperatures, made vital the provision of adequate flying clothing. Since every attack on the enemy from Britain involved an over-water flight, the problem of air/sea rescue was a great one. Though the efficient facilities of the RAF Air/Sea Rescue Service were available to the Eighth Air Force, it was necessary that our flyers be equipped with suitable life vests, dinghies, and survival equipment that they might survive in the sea until aid reached them. The Department of Physiology of the First Central Medical Establishment (Sp), collaborated with the other units concerned in the testing, development, and modification of such equipment.

A. Testing of Personal Flying Equipment:

It is a long distance between the drawing board and the sky over Germany, and the final test of every item of equipment occurs in the crucible of combat. It appears, therefore, that two major types of equipment testing are necessary, laboratory tests and actual use in combat.

1. Laboratory Testing.

In some respects the laboratory has advantages over other methods for testing of equipment. It is economical of time. Conditions of test may be accurately controlled and recorded. Certain tools, such as flow meters, gas analyzers, electrical measuring instruments, which cannot be used in combat flights may be utilized. In its program of laboratory testing, the Central Medical Establishment uses such devices. It makes considerable use of its low pressure chambers and through the facilities of the Royal Aircraft Establishment of a refrigerated low pressure chamber. This chamber is capable of producing low atmospheric pressures, temperatures as low as 60°C, and wind-blast of 20 mph. It is invaluable for the preliminary testing of oxygen equipment and flying clothing. Preliminary tests of air/sea rescue equipment such as life vests and dinghies are conducted in swimming pools and for rough water tests in the English Channel, the craft and shore installations of the Royal Navy are at its disposal.

Despite the careful control of all known factors, the experimenter is never certain that all combat conditions have been reproduced, simply because all of the environmental stresses incident to high altitude flying are probably not yet known. In addition, he knows that there are certain activities of the flyer using the equipment he cannot reproduce. For example, how long must an oxygen hose be to give a B-17 waist gunner sufficient freedom of motion? He cannot reproduce the complex hand and wrist movements of a gunner, and yet the standards of malleability of the wiring of electrcally heated gloves must depend on such information. So that even after the item of equipment has successfully passed the laboratory tests, final approval must be withheld until it is tested in flight. Such flight tests should be conducted first under

experimental conditions and then in combat, by the men and under the conditions in which the item will finally be used. Failure to insist on such service testing results in the production of large quantities of inefficient equipment.

2. Combat Service Testing.

Wherever possible, the Central Medical Establishment supervises the service testing of equipment from the first production run before the item is accepted for general issue in the Eighth Air Force. After a sufficient number of items for test is secured, usually from ATSC, arrangements are made with the Personal Equipment Officer of one or more of the three divisions as to which squadrons will conduct the tests. The equipment is usually brought to the squadrons by the officer of the CME to whom the project is assigned. At this time he demonstrates the equipment to the Personal Equipment Officer, explains the purpose of the test, indicates the nature of the information desired, and supplies the appropriate data records or questionnaires. If desirable, he may speak to the aircrew members who will use the equipment. After a suitable test period he returns to the squadron and determines the results of the test. This may be done by means of questionnaires, by interviews, and by the objective evidence afforded by actual failures in function. In some instances, members of the Central Medical Establishment have flown combat missions in order to test the functioning of special items of equipment. After sufficient data have been accumulated, a report describing the findings is forwarded to the Aero-Medical Laboratory, Wright Field and other interested agencies. The report may make one of three general recommendations:

a. That the item is entirely satisfactory.

b. That the item is unsatisfactory and is not likely to be rendered satisfactory by any practicable modification.

c. That certain modifications should be made before large scale production is begun.

B. Modification of Equipment.

If the modification is not urgently required the recommendation is transmitted to the ATSC, Wright Field, and its incorporation in production models awaited. If, however, the alteration is urgently required, an additional step is taken. A practicable method for performing the modification is described in a Technical Maintenance Instruction issued by Hq, ASC, US Strategic Air Forces in Europe, to the personal equipment sections of the divisions, groups, and squadrons, and to the air depots. The modification is then performed by the air depots and personal equipment sections on all items already in the theater. The history of the use of the A-14 mask by the Eighth Air Force provides an example of this and emphasizes the importance of adequate combat service tests.

The A-14 mask first became available to the Eighth Air Force in July 1943. The masks available were distributed to a number of fighter groups for testing because of a critical mask shortage in Fighter Command. After a period of use the data were

summarized and it was apparent that it had performed efficiently. Because of the difficulties with the A-9, A-10 and A-10R masks approval was granted for the use of the A-14 mask in bombardment aircraft even though service testing had not been done in such planes. An investigation showed a cause of the failure of the mask to be obstruction of the oxygen inlet ports due to freezing of condensed respiratory water vapor. This defect had not been discovered in the tests in the fighter squadrons because of the absence of freezing conditions in fighter cockpits. Further analysis showed that the failure was due to the low position of the inspiratory ports placing them in the direct path of the expiratory blast. Because of the urgency of the situation it was neither feasible to discontinue use of the mask nor to await modification of the production model. In collaboration with personal equipment officers in the field a member of the Central Medical Establishment designed a baffle which when properly cemented to the inside of the mask, protected the lower portion of the inspiratory ports from water vapor. This resulted in an immediate amelioration of the situation. The number of modified masks in use is increasing constantly and at present probably more than three-fourths of A-14 masks in use by the Eighth Air Force have been modified.

C. Design of New Equipment.

The Central Medical Establishment has initiated and collaborated in the design of a number of new items of personal equipment. It is not intended to list these but rather to cite a few examples and indicate their role in the solutions of problems encountered.

Soon after the introduction of the demand oxygen system it became evident that the quick disconnect junction between mask and regulator hoses was defective. It became loose after wear and was likely to come apart, thus exposing the flyer to oxygen lack. To date there have been 10 deaths and a larger number of non-fatal anoxia incidents due to this cause. Even where the quick disconnect functions properly the frequent checks required distract the flyer from the more immediate tasks involved in his encounter with the enemy. In order to eliminate this hazard as quickly as possible, a quick-disconnect lock (M-45) was designed and manufactured locally. Its use has had the desired effect. It is recognized that it serves only as a stop-gap until the quick-disconnect unit itself is provided with an efficient locking device.

The design of new equipment also had a role in the correction of shortages. During the first winter of operation there was a serious shortage of electrical flying clothing. The design and local manufacture of 3,000 units of a new suit aided in relieving the shortage.

Personal equipment must be efficient for the purpose for which it is designed and yet not jeopardize the safety of the flyer if he finds himself in unusual circumstances. For example, a parachute harness must be easily jettisoned on parachuting into water. Hence, the emphasis on quickly releasable harnesses. Similarly, electrically heated flying inserts may provide adequate warmth and yet be inadequate for walking. In order to provide both qualities an electrically heated overshoe was

designed to be worn over the G.I. shoe. Thus, if a flyer is forced down he has a good pair of walking shoes with him.

In many cases medical and personal equipment problems arise from factors in the design of aircraft. Thus, part of the high incidence of frostbite in waist gunners was due to the windblast from open waist windows. Recommendations that means be found for closing waist windows in heavy bombers resulted in a new type of closed waist window. This immediately simplified the clothing problem for some crew positions in heavy bombers.

D. Collection of Data.

By means of Unsatisfactory Reports from personal equipment officers and close liaison with them, data on equipment failures are collected and forwarded to the appropriate agencies. At intervals, surveys of major problems such as Anoxia, Air/Sea Rescue and the like are made for the information of all agencies concerned.

CONCLUSION:

The design and development of personal safety equipment must be a fluid process, sensitive to the ever-changing needs of the airmen. Since his needs depend in part upon factors beyond our control, such as the weather and the tactics of the enemy, it is desirable that technically trained personnel be an integral part of every combat Air Force for analysis of the functioning of such equipment and the collection of pertinent data. In the testing of personal equipment three techniques must be used; the laboratory test, the experimental flight, and the combat flight. Conclusions drawn and recommendations made on the basis of such tests must be practical. For while the airman of today cannot fight with the equipment still on the engineers' blueprint it is the lessons of today's combat which must modify the blueprint to bring the victory of tomorrow.

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SOME ANOXIA INCIDENTS DESCRIBED BY RETURNED COMBAT CREW PERSONNEL

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Related by Pilots

"I lost one clip to my mask so it was loose enough that it had to be held in order to get sufficient suction. When we began the bomb run at an altitude of 23,000 feet, I forgot about it. Before I knew it, I felt like I was in a dream. The co-pilot shook me and I could feel him but just couldn't make myself do anything. Then the top turret gunner turned on my emergency valve and I became normal again."

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"While flying at 25,000 feet, we were in a heavy flak barrage and several missiles had entered the cockpit, one of them cutting my hose in half and another striking the co-pilot in the leg without even breaking through his overalls. After about five minutes, I noticed my regulator bubble was not moving, but as I was probably already anoxic, I did nothing except to change my regulator from auto-mix "on" to "off," saying to myself, "I'm all right now -- I am getting 100% oxygen." A short time later, the co-pilot, who was a Major and Squadron CO, took over the controls and asked me to see if he was wounded where he had been hit. I looked and saw no hole in his coveralls and asked him if I should cut away his coveralls to see if he had a wound underneath. After this silly remark, he realized something was wrong and saw my hose had been cut. He told me about it and I took the end of the cut hose, sucked on this, and I immediately came back to normal; however, during the time I was anoxic -- 10 to 15 minutes -- I had kept the plane in perfect formation."

"We were on the way to the target, and in the climb when a check for crew members was called for, all responded except the tail gunner. The right waist gunner looked back and said, "Tail gunner looks like he's asleep." I was flying co-pilot at the time and I picked up a walk-around bottle and went back to the tail position. The gunner was completely out and shaking brought no response. I held his mask on tight and turned on the emergency knob. He quickly revived, very violently swinging his arms, but soon quieted and was perfectly all right for the duration of the mission. The cause for this anoxia was a mask imperfectly fitted. The incident occurred at 20,000 ft."

Related by Navigators

"On reaching 18,000 feet on my first mission, I became dizzy, with vision blurring badly. Realizing my outlet was on the bum, I connected to an outlet near the bombardier's position. Due to inconvenience to the Navigator's Table, I ceased navigating (we were flying a wing position). About one hour later we hit heavy flak and lost one engine. Thirty minutes later we hit bad weather, became separated from our formation and I had to start navigating. I had to resort to unreliable methods of ascertaining my positions which almost caused our plane to hit a mountain on descent through an overcast."

"This happened over Tripoli on my 7th mission. We fought off pursuits after hitting the targets. I suddenly felt weary and very tired -- decided I should retire earlier (maybe staying up too late) -- hard to think -- took a coon's age to do anything, decided to turn on more oxygen. I was still tired but felt somewhat better. At 10,000 feet the pilot called and said we could take off our oxygen masks. At that time I found I had just a mask on but the oxygen tube was on the floor. It had been cut through by enemy action without my knowing it."

Related by Top Turret Gunners

"On my 18th mission, we did not go above 18,000 feet. I had trouble getting my oxygen mask adjusted properly so I removed it and left it off. I looked at my watch frequently. It was a period of about 10 minutes when I didn't remember anything; this was just about the time we were over the target. The next thing I remember, I was just standing in the top turret; otherwise, I felt perfectly normal. Luckily there was no fighter opposition and it was an easy mission."

"About 20 minutes before the target, on my 31st mission, while flying at 20,000 feet, we were attacked by 25 enemy fighters and they were coming in fast. As I fired on one, he suddenly became blurred and I was very sleepy. Everything seemed to swim around for an instant and I realized I was without oxygen. I looked at the gauge and found the tank empty. I refilled it immediately but it soon emptied again. The tank was leaking. After a "shot" from the emergency I was OK."

"On our 10th mission our oxygen system was knocked out by flak, all except the waist gunner's and tail gunner's which held a pressure above 150 lbs. The pilot and navigator used walk-around bottles. The co-pilot, bombardier, radio operator and myself did without. We were at 21,000 ft. I was on watch for enemy aircraft, slowly moving the turret, not using much energy. I felt sleepy and weak but did not pass out. The radio operator lay on the floor and kept still. Neither did he pass out. The co-pilot and bombardier, trying to help the pilot and navigator keep bottles filled, passed out but nothing serious resulted from it. We were at altitude 45 minutes without oxygen on this mission."

"We were over 20,000 ft., on my first mission when we had to bail out. I became light-headed and sick to the stomach due to not taking a delayed drop."

"Anti-aircraft fire cut my oxygen line and also cut through my right leg. We were at 24,000 ft. I called the pilot and told him to dive the ship because I did not have any oxygen. I passed out and came to at 20,000. The right waist gunner had fastened a walk-around to my mask. It didn't last long. I passed out again and came to at 13,000 ft."

Related by Radio Operators

"We were under attack at 25,000 ft. on my 15th mission. I became weak while firing my guns so I looked at the oxygen gauge. I had to get my eyes within six inches of it to see that I was not getting oxygen. I checked my mask connection and found it laying on the floor. I connected it up and turned on a few moments of pure oxygen."

"On my first mission, my demand-mask hose became disconnected from my oxygen hose at 22,000 ft. I didn't realize this and became dizzy and my vision blurred. I was at my gun position and finally became unconscious after falling to the floor three times. A few minutes later I regained consciousness to see that my hose was disconnected. I had barely enough strength to call the pilot who sent the waist gunner to my rescue.

By this time, Jerry was attacking, so I went back to my gun position after the waist gunner helped me up and turned my oxygen regulator on emergency until I was completely revived."

"It was our group's first mission. No one knew much about the extreme cold. No one had electrically heated suits except the ball turret gunner, so we all had on heavy flight equipment. For that reason I had no chute on. We had just passed over the target and were in plenty of trouble--flak and fighters. No. 2 gas tank and engine were on fire. I heard the command "bail out" over the interphone. I pulled my oxygen mask and some of my heavy stuff off to get my chute on. I began to feel a little faint and my vision was blurred. Knowing instantly what was happening, I stuck the hose on the bail-out bottle, which was tied to my chute, in my mouth and everything was OK. During this time we had dropped from 24,300 to 17,000 ft."

"On my 15th mission, our crew flew a plane which had the demand oxygen system for the first time. No one knew anything about it. The ball turret's and my masks were not fitted right, which must have been the trouble. I came out of the ship after the mission so weak I couldn't hardly lift my feet to walk. During the flight at 23,000 I was sleepy, mentally confused, and didn't give a damn."

"On a mission to Frankfort, the oxygen supply was knocked out by flak in all except the forward position. We were at 25,000 ft. so we were forced to use oxygen bottles rather than leave the formation. We were able to get by by using walk-around bottles and lying relaxed on the floor."

"We were flying at an altitude of 27,000 ft. for about 1½ hours. When I tapped the waist gunner on the back to attract his attention, he fell over. I hooked his mask to a walk-around bottle and removed him to the radio room. In the radio room I put him on the regular oxygen system and used the emergency valve. I kept him in a reclining position for approximately one-half hour. While he was in the radio room, I covered him with extra flying clothes and cleared his mask of ice. In about 25 minutes he came back to his station."

"The waist gunner's oxygen mask tube was cut by flak and the gunner was never noticed until he started to stagger around as if he were drunk. The other waist gunner, being wounded, had trouble but called in on the interphone, so I went back to the waist with a spare mask. After forcing the mask on the waist gunner and putting on emergency, he recovered in a short time. The altitude was 24,000 ft."

"Our top turret gunner was a new gunner and became excited over a fire in the ball turret. He ran back without the aid of a walk-around bottle. I heard something hit the radio room door, and on jerking it open, he fell into the radio room unconscious."

Related by Ball Turret Gunners

"This happened on my first mission. The altitude was 25,000 ft. I had opened the door of the ball turret and was standing on the seat hooked up on a walk-around bottle and was getting down to position in the turret when suddenly I felt dizzy, my head began

to spin, and I began to black-out. I knew I was passing out and tried to hook up to the oxygen hose in my turret. Being dizzy, I nearly passed out. I couldn't seem to find the hose connection in the turret. I raised my arms up so as to attract attention (my interphone wasn't hooked up at the time). This was the last thing I remember. My left waist gunner saw I was in trouble so he called to the right waist gunner as his oxygen hose was the longest. He came to my aid--gave me a full bottle of oxygen. I still didn't come to, so he started me on my second one when I finally came to. After this I was O.K.--no ill effects."

"A waist gunner's hose was cut in two by a 30 caliber shell. When I noticed him, he was leaning out of the right waist, waving at everything he saw. We had to sit on him in order to get a mask on him. He came around in a few minutes. This happened at 23,000 ft."

Related by Waist Gunners

"We were at 20,000 ft. on my 8th mission and the ball turret operator found his guns were out and I had to fix them for him. I walked from the waist to the turret without an oxygen bottle and plugged my oxygen hose to the connection in the turret. While I fixed the guns, we ascended to 26,000 ft. and I still thought we were at 20,000 ft., so I just unplugged the hose and started back to my waist gun position. About half way back, the ship seemed to hit an air wave and I fell on my back. I realized that I wanted to plug my oxygen hose in the regulator and was trying to get up and put it in, but just couldn't get up. The other waist gunner saw me and he placed a fresh oxygen mask on my face and I came to right away. I didn't report it to anyone as I felt all right, with the exception that I had a slight headache and a backache which were O.K. the next day."

"The opposite waist gunner allowed his hose to become twisted by fastening it to his Mae West wrong. I asked a question--received no answer. I looked at his face. His skin was blue, his eyes closed, and he was sunk on his gun. I checked his gauge and noticed the red ball not bouncing. I unkinked his hose and turned on the emergency oxygen. He was mentally confused for a short time. He fired at flak bursts, thinking they were planes. No serious results were apparent. This happened at 24,000 ft."

"My ball turret gunner had the habit of getting out of his turret by first taking a deep breath of oxygen and running to the bomb bay and plugging his oxygen there and then after using the relief tube, he would take another deep breath and run back and get into the turret. One day he passed out on the cat-walk because he didn't have strength enough left to plug in so I stressed the fact that the walk-around bottle should be used, even though you may get by without using it for a while, as he did, but sooner or later you will get caught."

Related by Tail Gunners

"We had 75 lbs. oxygen pressure over the target at 25,000 ft. Later we dropped to 20,000 ft. after we dropped our bombs. The pilot and co-pilot were sucking on one high

pressure bottle. The effects were sleepiness and speaking slower over the interphone. As we dropped lower, the rest of the crew only took sips of oxygen when feeling out of breath. When we got to 17,000 ft., we gave all oxygen bottles to the pilot and co-pilot."

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AN ANALYSIS OF PERIODIC TYPE 64 PHYSICAL EXAMINATIONS ON 461 ALTITUDE CHAMBER TECHNICIANS FROM 10 AAF ALTITUDE TRAINING UNITS

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PURPOSE

To summarize the analysis of type 64 physical examinations on altitude chamber technicians of several altitude training units.

METHOD

Reports were studied from a total of ten altitude training units, representing 1174 complete type 64 physical examinations including laboratory studies, on 461 chamber technicians with a total of 42,054 chamber hours. The recorded maximum for a single crew member was 315 hours.

OBSERVATIONS

Eyes

Observations on the eyes were reported in a limited number of cases. In all instances of inspection, measure of pupillary equality and reaction, ocular movement and ophthalmoscopic examination, deviation from normal was seldom noted and in all cases such deviation existed on the first examination and remained unchanged.

One man was reported grounded by a defective visual field unassociated with exposure to low pressures. Change in visual acuity appeared more frequently than other abnormalties of the eye, but such changes were within a limited range with no consistency in direction.

Ears

Originally an attempt was made to correlate history of trauma to the ear on descent in the low pressure chamber with appearance of the tympanic membrane. Comparatively few abnormalities were recorded. These were either cases of healed scar with known etiology, usually otitis media in childhood, or acute aerotitis of varying intensity, resulting from chamber flights. A record of trauma to the ear on descent was noted in 66 cases; the significance of such a figure is open to question as experience has shown that chamber technicians are reluctant to report mild injuries to the ear.

In comparison of the results of audiometry it was generally agreed by various observers that serial records by different technicians in rooms not sound proofed were of little value. One unit reported a decibel loss greater than 20 in 9 cases; when 6 of these were rechecked they were observed to be normal.

Forty-four cases were reported to show a decibel loss ranging from -10 to -60 following the initial audiogram with no statement permitting correlation between decibel loss and length of exposure to low pressures. The cause, if known, was not recorded except in three cases where otitis media occurred prior to induction. It may be assumed that no change was found in the remaining cases.

Nasopharynx

Septal deviation appeared frequently with forty-six cases reported on the initial examination, to remain unaltered. The degree of obstruction varied greatly, 10 per cent to 75 per cent. As far as could be determined the presence of septal deviation did not interfere with repeated chamber flights to such a degree as to require grounding unless other contributing factors such as coryza or sinusitis existed.

The appearance of clouding or mucosal thickening in sinus roentgenograms after variable periods of exposure to low pressure was one of the most common findings. Although numerical results were not recorded in some instances, there were 23 cases of involvement of the antra of one type or another; with ethmoid air cells involved in 13 cases; sphenoid air cells, 3 cases and frontal sinuses, 9 cases. Other abnormalties such as septal spurs, nasal polyps, cysts and hypertrophy of the inferior turbinate were noted in relatively few cases. Although these latter abnormalties were observed on the initial examination in most cases. There was no notation of limitation of duty from the sinus involvement.

Teeth

Those reports in which comment was made on the appearance of dental caries or the loss of teeth uniformly agreed that the change was within the range of normal.

Respiratory System

Although there were no specific changes noted by those commenting under the heading of "respiratory system" the observation of serial chest films presented data of interest.

Nine cases were reported in which on the initial examination calcified nodules were observed either in the hilum or periphery and after a variable period of exposure to low pressures remained unaltered. The largest of these was described as a calcified hilar node 2.3 centimeters in diameter, considered to be disqualifying for aerial flight, and yet unaltered by 76 chamber flights or 126 hours of exposure to simulated high altitude.

Two cases of minimal apical fibrosis were reported, one present on initial examination and remaining unaltered, the other appearing after 65 chamber hours with no

history of intercurrent illness, and of such character as to necessitate grounding. In still another individual a right basilar lung infiltration present on the initial examination enlarged after two months of exposure to low pressures. This man was hospitalized with a questionably positive tuberculin; repeat films showed no progression.

Peribronchial markings suggestive of early bronchiectasis were observed on the initial chest film in three cases, two of which showed progression after approximately 70 chamber hours and both were grounded; the other remained unaltered. Isolated abnormalities such as rachitic funnel chest, N.C.D., two cases, chronic bronchitis, fusiform dilatation of ascending aorta, and mitral configuration of the heart in an individual with a history of rheumatic fever, were present on the initial examination and remained unaltered.

Among the fifteen (15) cases noted above, the nine (9) with calcified nodules must be considered as well healed lesions unaltered by exposure to low pressures, yet three of the remaining cases did show progression which questionably appears related to exposure to simulated altitude. Here as with other aspects of this paper conjecture only is in order; certainly no conclusions can be drawn from such a limited series.

Height

Height remained unchanged with the exception of a slight increase in those crew members still within the growth-age range.

Weight

Weight was observed to rise and fall in an almost equal number of cases, i.e., rise in weight in 43 cases, fall in weight in 41 cases. The only changes tabulated were in magnitude greater than 10 pounds. It is apparent that the majority of cases demonstrated no significant change.

Skin

A large variety of surgical and traumatic scars were noted to be present on the initial examination and remained asymptomatic and unaltered. No varicosities or other pathological changes were noted to occur in the extremeties.

Circulatory System

A slight rise or fall in heart rate was observed in a moderate number of cases; where actual figures were given a range of 5.4 to 10.3 beats per minute was noted. Several reports stated that all changes were "within the range of normal"; actual tabulation revealed an increase over the initial reading in 88 cases, a decrease in 106 cases, and no change in 37 cases. Abnormality of rhythm in the form of ventricular extrasystoles was reported in only one case for the entire group.

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Tabulation of the recorded change in systolic and diastolic blood pressure reveals the following figures: systolic increase 95 cases (range of 5.0 to 6.2 Mm Hg), diastolic increase, 101 cases (range of 6.2 to 9.2 Mm Hg), systolic decrease, 124 cases (range of 6.5 to 9.0 Mm Hg), diastolic decrease, 110 cases (range of 6.0 to 9.1 Mm Hg). No change was noted in systolic pressure in 31 cases, diastolic, 33 cases. No attempt was made to correlate these equivocal changes in blood pressure with duration of exposure to low pressures because of insufficient data.

Abdomen and Herniae

Numerous herniorrhaphy scars were reported unchanged by repeated exposure to low pressures. Five cases of relaxed inguinal rings apparently unrelated to chamber flights were noted. Surgical intervention of pilonidal cysts occurred in two instances, not related to activity, also hemorrhoidectomy was performed in two cases with no comment as to relation to repeated exposure to low pressures.

Genito - Urinary

Nine cases of absent, undescended or atrophic testicle were reported without symptoms. From those seven stations specifically commenting on this subject there were recorded 8 cases of varicocoele and two cases of hydrocoele with no change noted.

Two cases with positive serology were noted; both had received "adequate" anti-luetic therapy. The spinal fluid serological tests were reported as negative.

Neurological

The most frequent comment under this heading was "no neurological change noted." Neurological abnormalities did include persistent facial tic and tremor of extremities unrelated to exposure to low pressures. One observer suggested a "psychoneurotic trend" in a high per cent of the crew members based on observation of trainee reactions and hearsay evidence of the "dangers of exposure to low pressures". One case of migraine with augmented symptoms above 25,000 feet altitude necessitated grounding. Only two cases of "susceptibility to bends" were reported; one, a thirty-five year old crew member credited with 118 chamber hours who complained of the bends frequently. There was concomitant blurring of vision and persistent headache of one hour or more after descent with generalized weakness and lassitude for as long as twelve hours. Repeated neurological examinations were reported negative. Another crew member on the 28th chamber flight experienced moderate bends followed by severe frontal headache persisting at ground level for several hours. The next flight elicited a similar sequence of events without recorded neurological change and the individual was limited to below 30,000 feet altitude.

Urine Examination

Slight deviation in specific gravity fell within the range of normal in each case. One case of bacteruria was noted which subsequently cleared. All components of the routine urine examination were otherwise normal or negative.

Electrocardiography

Limited facilities prevented complete electrocardiographic records at some units. Abnormalities such as prolongation of the P-R interval were reported in 5 cases which were considered of questionable significance in the absence of the other pertinent findings and with no change in serial records. Only one such case was grounded. All appeared to be unrelated to chamber flights.

Records showing ventricular extrasystoles, mild right and left axis deviation, sinus arrhythmia, slurred QRS complex and tachycardia were noted but considered to be of little significance. One crew member whose electrocardiogram showed a broadened QRS complex was grounded because of a childhood history of diphtheria. Another case demonstrated changes "not unlike those of toxic myocarditis" but with the persistence of these changes in serial records and the lack of symptoms the man was not grounded. In still another case myocardial damage was suggested in the electrocardiographic record by the presence of low voltage T_1, elevated ST_2, and diphasic T_4, after 113 chamber hours. The L IV had corrected to an upright position after 172 chamber hours and the individual was maintained on normal duty.

Blood Count

From a total of 433 cases reported, 257 were apparently sufficiently complete for tabulation. Fifty-seven cases were not further classified than to be listed as "no consistent change" or "all within range of normal". Of the remainder, 82 cases were reported to show a decrease in erythrocytes (average 396,000 per cu. mm.) over the initial findings with a corresponding decrease in hemoglobin of 8.2 per cent (average), and 96 cases to show an increase in erythrocytes (average 484,000 per cu. mm.) with a corresponding increase in hemoglobin of 6.2 per cent (average). No correlation could be made between blood studies and duration of exposure to simulated altitudes because of insufficient data.

Relatively few cases were cited as showing either increase or decrease in leukocytes, the total being equal for either direction of change. In most instances there was either no notation or the comment was "no alteration beyond the range of normal". In all instances cited the variation of the differential counts was "within the range of normal."

RECOMMENDATIONS

In a relatively small number of cases were sufficient changes found to alter the recommendation of "qualified for altitude chamber operation." A total of eleven cases were grounded for various reasons; four reports did not comment on this matter and in only six cases could exposure to low pressures be incriminated as a factor in the change of recommendation. The occurrence of frequent bends, hypotension and weight loss, migraine precipitated by low pressure and mild anoxia, development of psychoneurotic changes, and the vague "loss of tolerance to changes in atmospheric pressure" are the listed factors.

Waivers were granted most commonly for defective visual acuity, 13 cases; antral and frontal sinusitis with roentgenographic changes of the sinus shadow, 11 cases; and isolated instances of over or underweight, allergic manifestations of mild degree and visual disturbances such as low visual accommodation, defective depth perception and color vision.

DISCUSSION

It must be emphasized that a lack of uniformity adds to the difficulty encountered in tabulation and comparison of the reports of the various altitude training units, and especially in assembling this heterogeneous data into an all-inclusive, brief resume.

It is apparent that the report stands on a somewhat less firm scientific ground because numerous personnel, while participating in the assembly of the mass of data, "were not appreciative of the ultimate objective." Nevertheless the weight of numbers cannot be minimized bearing in mind that 461 chamber technicians with over 42,000 chamber hours are represented. From this viewpoint the lack of positive findings as presented above system by system becomes definitely significant.

Isolated pathological changes are enumerated with reference to frequency and extent in various systems. Such changes appear to be unrelated to or unaltered by repeated exposure to low pressures with exception of roentgenographic change in the sinuses and the possible progression of already existent pulmonary lesions which appear to be related to the chamber "flights," although no control group has been studied.

Assembly of data from the various units further reveals no consistent change in direction of the erythrocyte count. The proposal that a significant decrease in erythrocyte count resulted from repeated exposure to low pressures, as suggested in the initial study of a comparatively small group of men, is not substantiated by the analysis of the more extensive data.

CONCLUSIONS

1. A summary is submitted representing reports from 10 altitude training units of 1174 type 64 physical examinations with laboratory studies, on 461 low pressure chamber technicians with a total of 42,054 chamber hours.

2. Tabulation of data by system reveals no significant change with the following exceptions:

a. A high incidence of clouding in the accessory sinuses of the respiratory tract as revealed by roentgenography in more recent examinations.

b. The progression of already existent pulmonary lesions in two cases with clinical signs augmented by exposure to simulated high altitudes and the appearance in a third case of a chest lesion by roentgenography after 70 hours of chamber flights.

3. Isolated instances are cited where neurological, roentgenographic, electrocardiographic or other pathological changes necessitate "grounding." These not only lack proof that repeated exposure to simulated high altitude, per se, is the

etiological factor, but are so infrequent as to lose significance in the group as a whole.

4. The proposal that a significant decrease in the erythrocyte count resulted from repeated exposure to low pressures, as suggested in the initial study of a comparatively small group of men, is not substantiated by the analysis of more extensive data.

* * *

NEURO-CIRCULATORY COLLAPSE IN RADIO GUNNERS SUBJECTED TO 18,000 FEET AND 20,000 FEET FOR 12 AND 15 MINUTES WITHOUT OXYGEN

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Altitude Training Unit, Yuma Army Air Field,
Yuma, Arizona

An Anoxia demonstration of 12 minutes at 18,000 feet was a part of all low pressure chamber flights given radio gunners at this unit until 26 September 1944. On this date, the anoxia demonstration was changed to 15 minutes at 20,000 feet. A certain small percentage of the subjects collapsed during such a demonstration. However, this collapse tends to occur at a particular time in those affected. Table I and Figure I present an analysis of the time relationship involved.

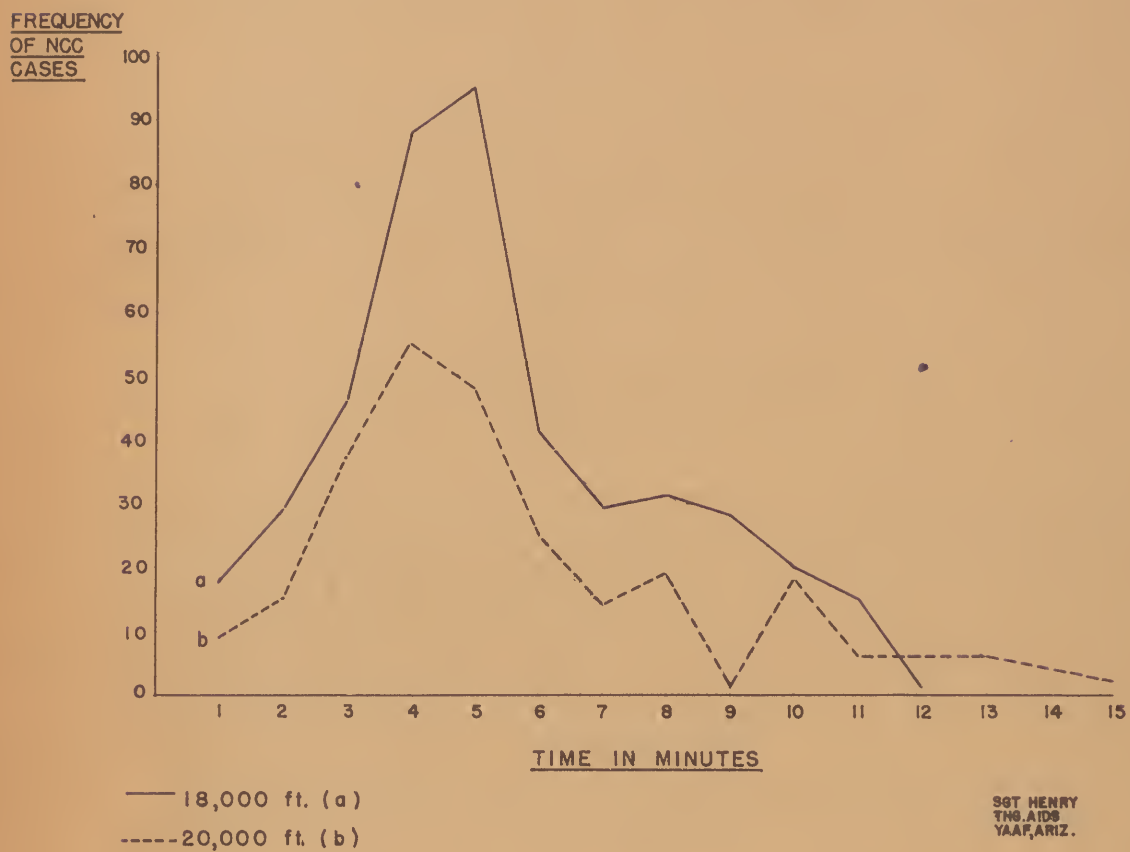
TABLE I

Tabulation of the data involved in the NCC cases at 18,000 and 20,000 feet.

	Altitudes	
	18,000 Ft.	20,000 Ft.
a. No. of NCC cases	441	265
b. Mean time for NCC	5.4 min.	5.6 min.
c. Median time for NCC	5.5 min.	5.3 min
d. Modal time for NCC	5 min.	4 min.
e. Standard dev. of mean.	5.4 + 2.2 min.	5.6 ± 3.6 min.
f. NCC during 5.4 ± 2.2 minutes (3.2 to 7.6 min.)	63.7%	--
g. NCC during 5.6 ± 3.6 minutes (2.0 to 9.2 min.)	--	82.3%
h. NCC during 1st 5 min.	62.6%	61.9%
i. NCC during 1st 10 min.	96.3%	90.9%

FIG. 1

RELATIONSHIP BETWEEN FREQUENCY OF NCC CASES AND TIME AT ALTITUDE



It is apparent that the percentage of neurocirculatory collapse cases during the first five minutes and during the first ten minutes at altitude is about the same at either 18,000 or 20,000 ft. About 62% of the neurocirculatory collapse cases occur during the first five minutes at either altitude. Furthermore, if collapse does not occur during the first ten minutes at either altitude, there is little likelihood that it will occur at all during the anoxia demonstration.

The largest number of cases of neurocirculatory collapse occur after five minutes at 18,000 feet and four minutes at 20,000 feet.

* * *

BAFFLE TANKS FOR TRAPPING TRICRESYL PHOSPHATE

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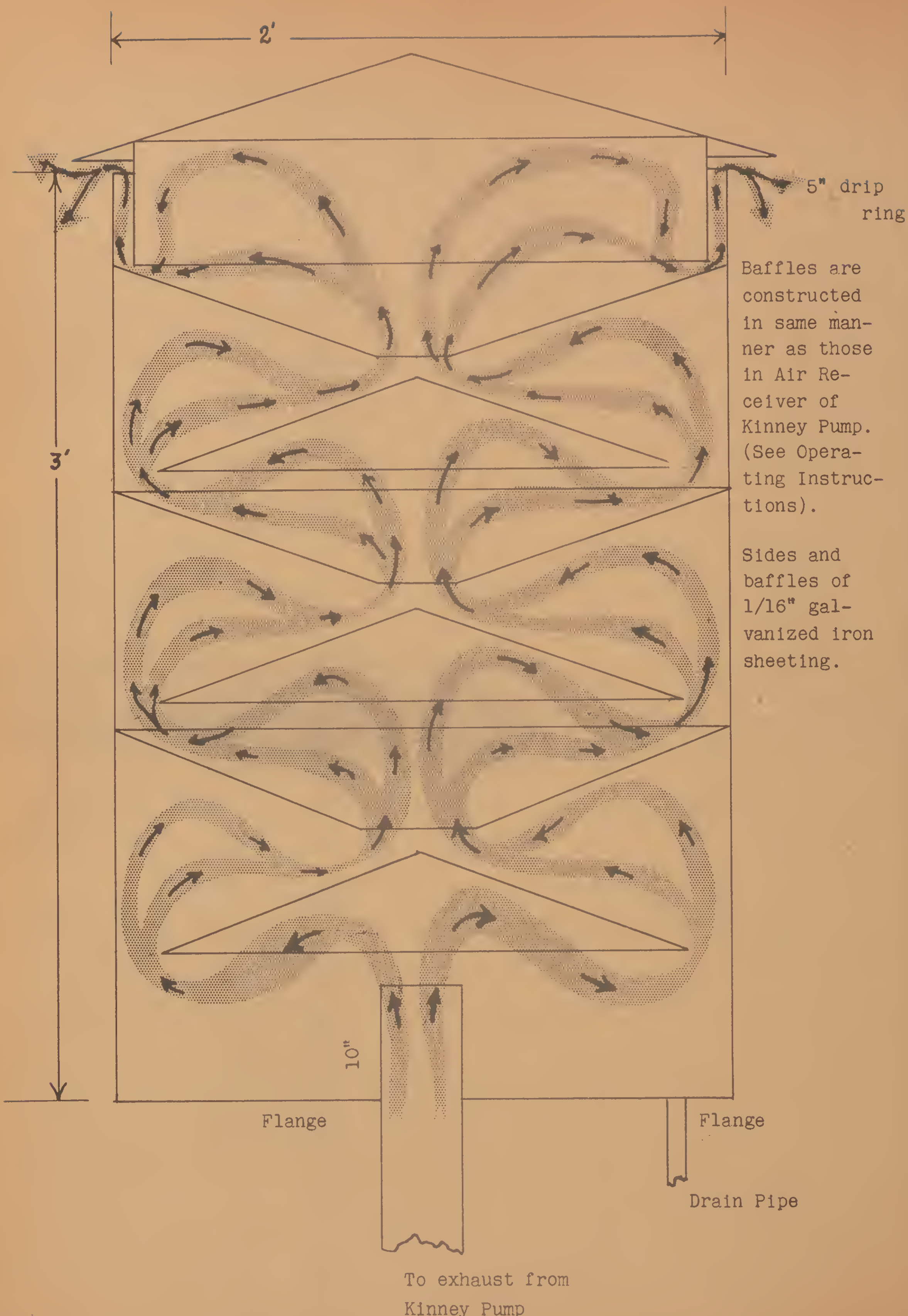
Chief, Altitude Training Program
Western Flying Training Command

Baffle tanks for trapping tricresyl phosphate at the Las Vegas, Nevada, and Kingman, Arizona, Altitude Training Units have given excellent service. At the Las Vegas Unit the tanks were set on platforms, separated by a few feet from the building to prevent tricresyl phosphate from destroying the composition roof. However, a platform of this type was found to be unnecessary, since tanks remain completely dry on the outside with no tricresyl phosphate condensing on any of surrounding structures. Visible vapor only emerges when chambers are ventilated excessively, but the small amount of vapor is rapidly dispersed.

Baffle tanks were constructed in Post Machine Shops by tinsmiths. Material was 1/16" gauge galvanized iron sheeting. Tank was first constructed with top and bottom halves separate. Baffles were then fastened in place by means of straps, riveted to baffle and to side of tank. Half sections of tank were then soldered together. Flanges were used to fasten pipes to bottom of tank.

When tank is put in operation, pipe of uniform diameter is connected from baffle tank to exhaust outlet above air receiver of Kinney Pump. Three-quarter inch drain pipe extends from bottom of baffle tank to interior of pump room. Valve is inserted in this pipe so that tricresyl phosphate can be drained directly into air receiver of Kinney Pump or into some other container.

The efficiency of the baffle system is increased by the presence of the drip ring. Under ordinary operating conditions it is necessary to drain reservoir following a continuous operation of approximately 12 hours. For an operating period of 12 hours per day and 6 days per week, the 25 HP Kinney Pump will require between 1 and 2 gallons of additional tricresyl phosphate to maintain the required fluid level.



Cross Sectional View of Baffle Tanks for Recovery of Tri-Cresyl Phosphate at ATU's, LVAAF and KAAF

INFLATION WITH VARIOUS GASES IN TREATMENT OF SEVERE AERO-OTITIS MEDIA

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INTRODUCTION

Inflation of the middle ear with helium has proved successful in speeding recovery from aero-otitis media. Highly satisfactory results from helium inflation were reported by Spiegel.[1] Routine inflation with helium at this station which resulted in the satisfactory recovery of 77% of severe cases of aero-otitis within 48 hours was reported by Blair.[2] This represents a dramatic improvement when compared with the 57% recovery in untreated cases.

The clinical investigation here reported was made to determine the value of inflation with other, more readily obtainable gases.

METHODS

The ears of each trainee were graded as to the degree of erythema, if any, of the drum following the first chamber flight. The grading was done on a four point scale,[2] and was done by an aviation physiologist during examination with an otoscope. Men exhibiting grades II, III, or IV aero-otitis had their ears inflated immediately after examination.

Ears were again examined routinely and graded when the students reported back 48 hours later for a second chamber flight. Satisfactory recovery involved complete disappearance of all symptoms or recovery to grade I (slight injection over the malleus). This report deals only with severe cases, grades III and IV, as mild cases, grade II showed 98% to 99% recovery with all of the gases used for inflation.

RESULTS

Nitrogen and helium proved to be equally effective inflation agents (Table I). With nitrogen inflation 75% of the students treated had recovered satisfactorily at the end of 48 hours. Of the men treated with helium 77% had recovered at the end of 48 hours. It is evident that these two inert gases are equally effective in speeding recovery from severe aero-otitis. Only 57% of untreated cases of severe aero-otitis cleared by the end of 48 hours. It is therefore, concluded that inflation with nitrogen or helium increases the rate of recovery from severe aero-otitis media by approximately 20%.

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1. - Spiegel, F. S. "Aero-otitis Treated by Inflation with Helium" - Air Surgeon's Bull., Vol. I, No. 6, pp. 9-10.
2. - Blair, W. F. "Use of Helium Inflation in Treatment of Aero-otitis Media." Report to Air Surgeon, 9 Nov. 1944.

Inflation with oxygen proved to be of no value in treating severe aero-otitis media. In fact treatment with oxygen resulted in a lowering of the recovery rate. Only 45% of the cases of severe aero-otitis treated with oxygen had recovered at the end of 48 hours. This rate of recovery compares unfavorably with the 57% rate in untreated cases.

The results from inflation with the three gases that have been used, helium, nitrogen, and oxygen, are consistent with the theory that filling of the middle ear with an inert gas is conductive to rapid recovery from aero-otitis media. Immediate relief from the pain of a retracted drum can be obtained by inflation with oxygen, or with any other gas or gaseous mixture. The inert gases, nitrogen and helium remain in the middle ear and maintain a normal pressure there. An active gas, such as oxygen, is absorbed through the mucous membranes of the middle ear with the result that the drum again becomes retracted.

TABLE I

Rate of recovery from severe aero-otitis media by gunnery students untreated and treated by inflation with various gases.

TREATMENT	NO: CASES	NO. MEN RECOVERED WITHIN 48 HOURS	% RECOVERED WITHIN 48 HOURS
Untreated	234	133	57
O_2 Inflation	97	44	45
He Inflation	341	263	77
N_2 Inflation	264	199	75

* * *

ANOXIA TOLERANCE

Captain Hurley L. Motley, M.C.
Chief Altitude Training
Maxwell Field, Alabama

The following is quoted from an article in The Cadet News, Vol. 1, No. 33, Maxwell Field, Alabama, June 23, 1944:

"CADET STAYS AT 35,000 FT. WITH NO OXYGEN - Aviation Cadet Harry D. McMullen, of Section P, Squadron E, who has 1,200 hours in the air as a civilian navigator, engineer and technician and 450 to 500 as a pilot, owes his life to the fact that he can get along at high altitudes without an oxygen mask.

He proved it recently at Maxwell Field when he stayed 30 minutes in the high altitude chamber without a mask and didn't pass out, the first time anyone has ever done this here.

Flying in a B-24 as a navigator at 35,000 feet from Canton Island to Australia in September 1942, McMullen had his narrowest escape when the safety connection on his oxygen line broke. The pilot couldn't bring the plane down to lower altitude because they were in the combat zone and the Liberator was unarmed.

So for 15 minutes, at an altitude at which 999 out of 1,000 men would pass out in a few minutes, McMullen struggled to repair the connection and get his mask back on. Near the end he had to have help, but only the fact that it meant his life made him carry on, he says. The pilot said later it was the first time he had known anyone to stay conscious at that altitude for so long."

The above named cadet was called back for a special chamber flight to determine his tolerance for anoxia and to correct the exaggerated claims that had been made, which the cadet believed and which others also would likely believe. On the test flight, the cadet was taken up at the usual rate of ascent, 2,000 ft. per minute, with only an inside observer. The chamber was well ventilated and all regulators were checked for oxygen leaks.

The following write-up appeared in the July 14, 1944 issue of the Cadet News and it is quoted below:

"'CADET NEWS' FEATURE EDITOR NORMAL BEING AFTER ALL - In the issue of The Cadet News of June 23rd a story appeared concerning our present Feature Editor, A/C Harry D. McMullen under the headline, 'Cadet Stays At 35,000 Feet with No Oxygen.' The story told of how he stayed in the high altitude chamber here at Maxwell for over 30 minutes without a mask and without passing out.

Last week Mr. McMullen agreed to give the chamber another crack at himself. He, as well as the Director of the Altitude Training Unit, Capt. Motley, was interested in determining exactly his ability to withstand anoxia (oxygen lack) on a carefully controlled "flight."

Well, to make a long story short, Mr. McMullen passed out at 29,000 feet. To this fact Capt. Motley remarked, 'Cadet McMullen has a slightly above average oxygen tolerance.'

'When a person is anoxic one's actions are unpredictable. His reasoning, power, judgment and memory are faulty and unreliable because the brain is affected first.'

As for McMullen's first chamber run, Capt. Motley has this to say: 'Occasionally oxygen leaks may develop on a chamber flight or the excessive use of oxygen by others in the chamber or the lack of proper ventilation - all these may result in an increase in the percentage of oxygen in the chamber above the usual 20.96%. This accounts for the so-called 'supermen' who can withstand oxygen lack in altitude chambers.'

Down here in our office in Building 41 we are very much relieved to learn that our Feature Editor is a normal human being after all. Oxygen lack has no respect for rank. It gets the General or the Private or our own Mr. McMullen. There are no

'supermen' who can get along without supplementary oxygen at high altitudes.'"

This cadet was very much chagrined at his failure to withstand anoxia at high altitude. He was so sure that he could repeat the performance as reported on the first flight.

On the first flight 30,000 feet was the actual pressure altitude at which he was held, and the records of the Altitude Training Unit revealed that the time was 9 minutes instead of 30.

Reports such as the above are prone to appear in published form from time to time. All reported cases of "supermen" to anoxia have been checked here if possible. So far, we have found none in over 100,000 trainees.

Our impression is that few individuals remembered reading the second article quoted above. However, we have been asked many times about the cadet who stayed for 30 minutes at 35,000 feet with no oxygen. The above demonstrates the need for careful checking by competent trained personnel of all articles similar to the above before publication. Some individuals may have a serious accident as a result of reading the original story with the attitude that "if he can do it, so can I." Therein lies the danger.

*   *   *

THE EFFECTS OF PROLONGED STAY WITHOUT OXYGEN AT RELATIVELY LOW ALTITUDES ON THE ABILITY OF RADIO GUNNERS TO TAKE CODE

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Altitude Training Unit, Yuma Army Air Field,
Yuma, Arizona

In a previous paper published in The Aviation Physiologist's Bulletin the effects of anoxia on the ability to take radio code were reported (Aviation Physiologist's Bulletin No. 6 Page 9). The experiments there described indicated an average decrease in efficiency of about 19% after a stay of ten minutes at 18,000 feet. In the present study an effort was made to determine the lowest altitude at which more prolonged exposure to anoxia produced a demonstrable impairment of ability to take radio code.

Subjects in these chamber flights were brought from ground level to altitude (10,000 or 14,000 ft.) where they remained for two hours without using oxygen and were then returned to ground level. Radio code was transmitted to the subjects (100 characters at the rate of 75 characters per minute, equivalent to 15 words per minute) immediately before and after the flight and at 40 minute intervals during the flight, making for 5 transmissions in all. Three different code tapes

were used, all of which contained the same characters in the same frequency. The order of giving the code tapes was varied so that one of 6 different combinations was used on successive flights.

The average of the scores made by the subjects while at ground level, immediately before ascent to altitude is taken to be representative of the efficiency of the men in taking code under normal conditions. Table 1 shows the extent of the loss of efficiency during the two hour period at 10,000 ft. to be as follows: (0.0% after 15 minutes, 0.2% after 25 minutes) 0.3% after 40 minutes, 0.0% after 80 minutes, 0.0% after 120 minutes, and 0.1% after the return to ground level (Figures for 15 and 25 minutes are taken from a previous report and are inserted for comparison.). The results indicate that at no time during the two hour period was there any serious loss in efficiency (inability to take code) as a result of the slight anoxia of 10,000 ft. altitude. The figures 0.2% after 25 minutes and 0.3% after 40 minutes probably indicate that although the slight anoxia of this altitude has no effect during the first 15 minutes, it does begin to have some effect after 25 minutes and this is true even after 40 minutes. However, there is no loss in efficiency after 80 minutes and 120 minutes, which would tend to indicate that adjustment took place. The men were able to function with normal efficiency after a little over an hour at altitude. This conclusion seems well substantiated by the fact that the blue lips, which characterized the appearance of the subjects during the early part of the flight seemed to disappear toward the end of the flight.

Table 1 shows the extent of loss of efficiency during the two hour period at 14,000 ft. to be as follows: (1.3% after 15 Minutes) 1.8% after 40 minutes, 1.8% after 80 minutes, 2.2% after 120 minutes and 0.5% after the return to ground level. The results indicate that there is no adjustment to an altitude of 14,000 ft. during the two hour period. The subjects get progressively worse until after 2 hours the loss in efficiency amounts to 2.2%. The men complain of being tired and sleepy on returning to ground level and indeed they are quite irritable. It is not surprising therefore to find that their efficiency does not return to normal - (even though oximeter readings show that the blood oxygen content does return to normal immediately after reaching ground level.) The o.5% loss in efficiency on returning to ground level after two hours at 14,000 feet is therefore attributed to a fatiguing effect induced by the prolonged effects of slight anoxia.

It may be well to mention that while no individuals experienced any serious difficulty at 10,000 ft., 1.5% of the individuals show reactions severe enough to warrant their return to ground level before completion of the flight at 14,000 ft. All the individuals who reacted had a history of having passed out during the anoxia check (at 20,000 ft.) during the altitude training indoctrination.

Oximeter readings were taken on 6 individuals during the 14,000 ft. flights. Due to the fact that the number of cases is so small, the figures are presented only as a

matter of interest. Table 2 shows that the average blood-oxygen saturation is set arbitrarily at 95% when the subject is at ground level. During the entire 2 hr. period at 14,000 ft. the oxygen saturation remains fairly constant at 76%. On the return to ground level, the oxygen saturation goes back to normal. From these readings, one is led to believe that a blood-oxygen saturation of 76% is sufficiently below normal so that prolongation of this insufficiency makes the subject less and less efficient in the same manner that an individual who is fed precisely the same starvation diet from day to day becomes progressively ill as time goes on.

TABLE 1

LOSS OF EFFICIENCY INCURRED WITH PROLONGED STAY AT ALTITUDE

		Minutes at Altitude					
No. Subjects	Altitude	15 Min.	25 Min.	40 Min.	80 Min.	120 Min.	After Flight
195	14,000 ft.	1.3%	--	1.3%	1.8%	2.2%	0.5%
165	10,000 ft.	0.0%	0.2%	0.3%	0.0%	0.0%	0.1%

TABLE 2

OXIMETER READINGS TAKEN ON SIX DIFFERENT SUBJECTS DURING FLIGHTS TO 14,000 FEET

Ground Level	15 Min.	30 Min.	45 Min.	60 Min.	75 Min.	90 Min.	105 Min.	120 Min.	Ground Level
95%	80%	79%	77%	77%	76%	74%	74%	72%	96%
95	77	75	75	75	75	77	80	77	94
95	80	78	77	77	76	79	81	81	96
95	77	78	76	75	74	75	75	74	95
95	74	74	76	76	74	74	75	76	95
95	71	72	73	74	76	77	77	78	98
Av 95%	76%	76%	76%	76%	75%	76%	77%	76%	96%

*Two oximeter ear pieces were fitted on each subject, so that the above readings represent the average for both left and right ear. The blood-oxygen saturation was set arbitrarily at 95% at the start of the flight.

*.

MOBILE ALTITUDE TRAINING UNIT HERE IS UNIQUE

- Godman Field Beacon -

Standing on a siding at the Fort Knox Railroad Station directly opposite the Armored Board building is "an only one of its kind," the Mobile Altitude Training Unit.

The Unit contains two railway cars, one of which holds a standard 20 man Low Pressure Chamber which is used in the altitude indoctrination program of flying personnel, and is capable of simulating altitudes to 40,000 feet. This car also contains the machinery for operating the unit, such as vacuum pumps, air conditioners and heaters, and a gasoline operated electric generator. Although at this station the Unit is operated by electricity from the Godman Field supply, when it is moved to an area where no electricity is available, power to operate may be obtained from the gasoline generator.

The second car, known as the Classroom Car, was at one time a private Pullman. The bedrooms have been converted into a classroom (seating capacity 25), the old dining room is now an office for the Aviation Physiologists, and the kitchen and butler's pantry are now used to store oxygen supplies and as a place to disinfect and dry oxygen masks. The Unit is complete, compact, and capable of being easily moved where needed.

The building of this unit started in October 1943 and the equipment was accepted by the Materiel Command in September 1944. It was immediately moved to Godman Field where certain necessary supplies were obtained from air force supply; and on October 23, 1944, exactly a year from its inception, the Mobile Altitude Training Unit commenced its training mission.

*　　　*　　　*

NOTE: Physiologists who are engaged in Aviation Research or Aviation duties in the Army or Navy are eligible for affiliated membership in the Aero Medical Association of The United States which includes virtually all the privileges of regular membership except that of voting or holding office. An individual must be proposed by two members of the Association.

*　　　*　　　*

Accidents due to Anoxia (Incomplete reports)

January 1945

	TG	TTG	BTG	WG	N	RO	B	NTG	P	Co-P	Total
Causes											
Faults in Equipment											
Ice in mask or hose	5(1)*	2	1	6 (1)*	2	2	2(1)*				20 (3)*
Hose disconnected	2	6(1)*	1			4(1)*			1*		14 (3)*
Defective hose			1								1
Defective walk around bottle			1								1
Defective regulator	1										1
Oxygen supply in walk around bottle insufficient			1								1
Personal											
Failure to use mask	1		1	3							5
Failure to use walk around bottle			2				1				3
Emergency valve left open			1							1	2
Unknown	1				1	1				1	4
TOTAL	10	8	9	9	3	7	3		1	2	52 (6)*

* indicates one fatality unless otherwise specified by numbers in brackets.

TG - Tail Gunner
TTG - Top Turret Gunner or Engineer
BTG - Ball Turret Gunner
WG - Waist Gunner
N - Navigator
RO - Radio Operator
B - Bombardier
NTG - Nose Turret Gunner
P - Pilot
Co-P - Co-Pilot
YO - Y Operator

Accidents due to Anoxia (Incomplete reports)

December 1944

	TG	TTG	BTG	WG	N	RO	B	NTG	P	Co-P	Total
uses											
Faults in Equipment											
Ice in mask or hose	1	1	2	1	1		1				7
Hose disconnected	1	3*	2			2(2)*	1				9 (3)*
Defective Regulator	1					1*					2 (1)*
Defective Oxygen system			1								1
Oxygen supply in walk around bottle insufficient				1		1					2
Personal											
Removal of mask	1	1		1							3
Loose Mask				2		1					3
Failure to use walk around bottle						1					1
Shut off of oxyg. valve		1*									1 (1)*
Accidental pinching of hose	2*										2 (1)*
Ignorance of altitude		1*									1 (1)*
Individual pinned between oxygen tanks		1*									1 (1)*
Combat											
Flak						1					1
Unknown	1*	1*				1					3 (2)*
TOTAL	7	9	5	5	1	8	2				37 (10)*

INCIDENT IN THE THIRTEENTH AIR FORCE

A case is reported by Major Robert M. Phillips, M.C., in which oxygen saved a man's life when he was below sea level.

"A P-38 pilot had his oxygen mask on when he went down to strafe. After he got over the water he crashed into the sea and the plane immediately sank. He estimates it was down to 40 or 50 feet below the surface before he could get out of the plane. He attributes his being alive to the fact that he kept his mask on so that he was breathing oxygen until he was free of his harness. All he had to do then was kick clear of the plane and float to the surface."

*   *   *

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